

We claim:

1. A medical tubular structure comprising:
  - a lumen extending through at least a portion of the tubular structure;
  - an overlying layer; and
  - a support layer having a contiguous coil element, a braid element or a weave element including a plurality of loops, the support layer being attached to the overlying layer at a bonding point and further having a free portion, wherein the free portion is slippable relative to the overlying layer.
2. The tubular structure of claim 1, wherein the loops are moveable to reposition relative to each other as the tubular structure is bent.
3. The tubular structure of claim 1, wherein the bonding point is at one end of the support layer and the remaining portion of the support layer is the free portion.
4. The tubular structure of claim 1, wherein the structure is flexible around a .75 to 1.50 radius object without kinking.
5. A medical tubular structure comprising:
  - a lumen extending through at least a portion of the tubular structure;
  - a thermally shrinkable sheath having a plurality of etches on at least its interior surface,
  - a support having a contiguous coil element, a braid element or a weave element including a plurality of loops, the support layer being attached to the sheath at a bonding point and further having a free portion, wherein the free portion is slippable relative to the sheath; and
  - wherein the sheath encases the support layer by heat-reduction of 25 percent or less of an original diameter of the sheath to at least substantially maintain the etches during the heat-reduction.
6. The tubular structure of claim 5, wherein the sheath comprises a polytetrafluoroethylene material.

7. The tubular structure of claim 6, wherein the sheath comprises PTFE, Teflon<sup>®</sup>, FEP and/or PFA.
8. The tubular structure of claim 5, wherein the support layer includes the contiguous coil element comprised of a wire and a plurality of gaps between each loop, the gaps being of sufficient size to resist kinking of the tubular structure.
8. The tubular structure of claim 8, wherein the length of each gap is about 10-200 percent of the width of the wire.
9. The tubular structure of claim 8, wherein the structure is flexible around a .25 to .50 radius object without kinking.
10. A medical tubular structure comprising:
  - a lumen extending through at least a portion of the tubular structure;
  - an underlying layer in the wall of the tube; and
  - a thermally shrinkable sheath having a plurality of etches on at least its interior surface, the sheath encasing at least a portion of the underlying layer by heat-reduction of 25 percent or less of an original diameter of the sheath to at least substantially maintain the etches during the heat-reduction .
11. The tubular structure of claim 10, wherein the sheath comprises a polytetrafluoroethylene material.
12. The tubular structure of claim 11, wherein the sheath comprises PTFE, Teflon<sup>®</sup>, FEP and/or PFA.
14. The tubular structure of claim 13, wherein the underlying layer includes the contiguous coil element comprised of a wire and a plurality of gaps between each loop, the gaps being of sufficient size to resist kinking of the tubular structure.
15. The tubular structure of claim 14, wherein the length of each gap is about 10-200 percent of the width of the wire.

16. The tubular structure of claim 10, wherein the sheath is bonded to the underlying layer in at least one end of the sheath and the sheath is capable of slipping along the underlying layer as the tubular structure is bent.
17. The tubular structure of claim 16, wherein the structure is flexible around a .25 to .50 radius object without kinking.
18. An intracorporeal medical device comprising:  
an operating head, and  
a catheter comprising:  
a lumen extending through at least a portion of the tubular structure;  
a thermally shrinkable sheath; and  
a support layer encasing the lumen and having a contiguous coil element, a braid element or a weave element including a plurality of loops, the support layer being attached to the sheath at a bonding point and further having a free portion, wherein the free portion is slippable relative to the sheath; and  
wherein the sheath diameter is heat-reduced around the support layer by 25 percent or less of an original sheath diameter, the sheath comprising a polytetrafluoroethylene material having a plurality of etches on its interior surface.
19. The device of claim 18, wherein the at least a portion of the support layer includes gaps between each loop of the coiled element, the gaps being of sufficient size to resist kinking of the tubular structure.
20. The device of claim 18, further comprising a drive shaft extending within the catheter and drive system.
21. The device of claim 20, further comprising a control system to direct rotation of the drive shaft.
22. A method of constructing a medical tubular structure, comprising:

producing etches in the interior surface of a thermally shrinkable tube comprising a polytetrafluoroethylene material, and  
heating the thermally shrinkable tube for sufficient temperature and length of time to reduce the tube around an underlying layer by 25 percent or less in diameter of an original diameter of the tube,  
wherein etchings are substantially preserved during the heating.

23. The method of claim 22, wherein the underlying layer includes a contiguous coil element extending along the longitudinal length of the underlying layer, the coil element having a plurality of loops.

24. The method of claim 22, further comprising rubbing the tube across an arched surface with sufficient force to break any friction between the loops of the coil element and the tube.

25. The method of claim 22, further including bonding at least one of opposing ends of the tube to the underlying layer to permit slipping of the tube along the underlying layer between the opposing ends of the tube.